Transforming Electricity into Light and Heat

Electricity is most commonly used to produce light. With a flick of a light switch, electricity is sent to a light bulb and transformed, or changed, into light and heat. An incandescent light bulb produces light by heating a filament (Figure 1). Did you know that electric lighting has only been around since the early 1880s?

How is electricity transformed into light in a light bulb? The filament in a light bulb resists the flow of electric current. Like a crowd of people trying to get through a narrow hall, the electric charges meet resistance as they travel along the filament. This makes the filament so hot that it turns red and then white. The extreme white heat creates the light that you see. The filament does not burn because it is made of a tough metal called tungsten. The glass bulb surrounding the filament is filled with a gas that does not allow burning. Eventually, the filament gets so thin that it breaks and the bulb has to be replaced.

Have you ever touched a light bulb when it was on? If you have, you know that not all the electricity is changed into light. Some of the electricity is changed into heat. This heat is wasted. It goes into the air around the light bulb and is not used for anything (Figure 2).
Some appliances, such as toasters, heaters, and hair dryers, are designed to produce heat. The wires inside a toaster are similar to the filaments in a light bulb. They resist the electric current and produce heat. This heat toasts your bread. The wires also produce light—the orange or red glow.

Fluorescent [flo-REHS-uhnt] light bulbs also use electricity to produce light. A fluorescent light bulb is a glass tube that contains gases. These gases produce a special type of light, called ultraviolet light, when electricity is passed through them. A coating inside the fluorescent tube absorbs the ultraviolet light and produces the light that you see. Fluorescent light bulbs use a lot less electricity and last much longer than incandescent light bulbs.

Light emitting diodes, or LEDs, are used in digital clocks, bicycle lights, Christmas lights, newer traffic lights, and calculators. LEDs are tiny solid light bulbs that are very energy-efficient (Figure 3). They produce very little heat because they do not have a filament. As well, they last much longer than other types of light bulbs. They are expensive, however. As the price of LEDs falls, more and more electrical appliances will use them.

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**CHECK YOUR UNDERSTANDING**

1. When electricity is transformed into light, another form of energy is produced. What is it?
2. Why do many people now use fluorescent light bulbs instead of incandescent light bulbs?
3. What are three advantages of LEDs?